The enigmatic *Ipomoea polpha* R.W.Johnson (Convolvulaceae)

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Summary

Johnson, R.W. (2006). The enigmatic *Ipomoea polpha* R.W.Johnson (Convolvulaceae). *Austrobaileya* 7(2): 311–317. Variation within *Ipomoea polpha* is discussed and three subspecies recognised, two subspecies, *I. polpha* subsp. *latzii* R.W.Johnson and *I. polpha* subsp. *weirana* R.W.Johnson are described as new. Causes of the widely disjunct current distribution of the three subspecies are postulated.

Key Words: Convolvulaceae, *Ipomoea polpha*, *Ipomoea polpha* subsp. *polpha*, *Ipomoea polpha* subsp. *latzii*, *Ipomoea polpha* subsp. *weirana*, new subspecies, Australian flora, Northern Territory flora, Queensland flora, identification key

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Introduction

The taxonomic problems associated with *Ipomoea polpha* R.W.Johnson began when Mueller & Hill described *I. calobra* from a specimen collected by Hill from the Barcoo River (Mueller 1879). The specimen was collected from a vine climbing up mulga trees and only one flower was available for description. This specimen was associated with the name "Calobra". Later in the same volume Mueller (1881) added further information to the description following receipt of a specimen with flowers and fruit from Fitzgerald, collected from between the Moonie and Balonne Rivers. The common name "Weir" was associated with the latter specimen. However, the Fitzgerald specimen was not of *I. calobra* but of the south Queensland population now associated with *I. polpha*. The description of *I. calobra* provided by Bailey (1901) in the Queensland Flora was based on these mixed collections.

Ipomoea polpha was described from a specimen collected south of Mareeba in northern Queensland (Johnson 1986). The author noted that beside the populations from North Queensland, a population in the Northern Territory probably belonged to this species and warranted subspecific rank. In addition, populations from the Surat – St George district in southern Queensland also appeared to be related to the other populations.

Austin *et al.* (1993) treated these three population groups under *I. polpha sensu lato*. Restriction fragment length polymorphism (RFLP) analysis was used in their study on a group of species related to *I. gracilis* R.Br. This showed the three population groups were tightly grouped. Molyneux *et al.* (1995) studied the glycosidase inhibitors swainsonine and calystegine B_2 in each of the three population groups. They suggested a close chemotaxonomic relationship among the populations but noted differences in the composition of minor constituents suggesting they may be specifically distinct.

These three population groups are very discrete geographically and are separated from each other by more than 1000 km (**Map 1**). All three taxa have well-developed tuberous root systems which provided a very valuable source of food for local aboriginal tribes. The close morphological similarity and the very discrete distribution indicate these populations should be regarded as subspecies of *I. polpha*.

The three population centres are:

1. North Queensland populations. These populations extend along coastal ranges from southwest of Lakeland Downs (north of Mareeba) in the north to southwest of Home Hill and west to Hughenden.

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2. Northern Territory populations. These populations are confined to approximately 100 km^2 on Stirling and Ti Tree stations, *c.* 200 km northeast of Alice Springs.

3. South Queensland populations. These populations are found in the Roma– Surat– St George area of southern Queensland except for an outlier *c.* 42 km northwest of Adavale.

Taxonomy

Ipomoea polpha R.W.Johnson, *Austrobaileya* 2: 220 (1986). **Type:** Queensland. Cook District: *c.* 3.5 km N of Walkamin on road to Mareeba, 30 January 1980, *J.R.Clarkson 2754* (holo: BRI).

Perennial herb with a well-developed tuberous root system, with trailing, terete, annual stems to 4 m, becoming thick, hollow and ribbed, glabrous to sparse or rarely moderately hairy with very short hairs. Leaves petiolate; petiole 15–80 mm long, petiole length to blade length 0.25–0.6; leaf blade broadly ovate, oblong-ovate to elliptic, 50–280 mm long, 25–230 mm wide, length: breadth ratio 1–3.5, apex obtuse to rounded, rarely acute, slightly emarginate, mucronate, base tapering, obtuse, truncate to cordate, glabrous to sparsely or rarely moderately hairy with very short, tubercle-based, weakly ascending to erect hairs, 0.1–0.2 mm long, with a midrib and 7–14 pair of secondary veins, bearing at the base dark red irregularly linear to narrowly oval glands, 0.3–2 mm long. Inflorescence axillary, cymose, compound, bearing 1–10 flowers; peduncle terete, becoming slightly ribbed, stout, 20–300 mm long, hairs as for the stem; bracteoles opposite to sub-opposite, occasionally alternate, ovate to triangular, rarely oblong, 2–7 mm long, 2–3 mm wide, apex rounded or obtuse, rarely acute, shortly mucronate, ± glabrous, often with short hairs at mucro, deciduous at flowering; pedicel stout, terete, dilated upwards, 8–55 mm long, glabrous to sparsely, rarely moderately hairy, bearing at the base of the calyx 5 linear to lens-shaped dark reddish-purple glands, with raised margins, 0.5–3 mm long. Outer sepals concave, ovate, ovate-elliptic or oblong-elliptic, 7.5–16 mm long, 4–11 mm wide, apex obtuse to rounded, occasionally emarginate, mucronulate, base rounded, ± glabrous, with a few very short hairs at the tip, thick, becoming leathery, with a thin hyaline margin, surface smooth, with 3–5 or more fine darker longitudinal veins; inner sepals concave, ovate, ovate-elliptic, oblong-elliptic to ovate-oblong, 10–18 mm long, 6–14 mm wide, apex obtuse to rounded, occasionally emarginate, shortly apiculate, mucronulate, base slightly cordate, truncate or rounded, thick with a narrow hyaline margin, ± glabrous, occasionally with a few very short hairs at tip. Corolla funnel-shaped, deep pink to pinkish-purple with a darker throat and midpetaline bands, 50–100 mm long, 75–120 mm across, glabrous, except for occasional short hairs in the upper part of the midpetaline band; petal segments 60–110 mm long, 40–75 mm wide at the limb, distally rounded, bilobed, often apiculate. Stamens affixed for 6–15 mm from base of corolla, terete, dilated downwards, free for 8–30 mm with dense, cylindrical, sinuate, 2-celled hairs, 0.5–1.5 mm long, around the point of attachment and for 2.5–11 mm up the filament; anthers linear, linear-oblong to narrowly ovate-lanceolate, 5–11 mm long, 1.5–2.5 mm wide, apex obtuse to rounded, apiculate, occasionally emarginate, base sagittate, lobes 0.8–1.5 mm, splitting lengthwise, curling back and slightly twisted. Ovary ovoid, 2–2.5 mm high, on a raised yellow disk, glabrous; style 20–42 mm long, glabrous, stigma biglobular. Capsule ovoid to globular-ovoid, with a persistent style base, 15–25 mm long, 10–13 mm diameter, glabrous, splitting longitudinal into 4 valves. Seeds 1/4 pear-shaped, light brown to black, 10–12 mm long, 5–7 mm wide, ± glabrous to sparsely hairy, with short brown hairs to 0.5 mm around hilum and occasionally along the 2 outer margins.

The three populations mentioned above are morphologically very similar. They are certainly isolated geographically, and are evolving independently of each other. However, finding clear-cut diagnostic features to discriminate the populations has been difficult.

Key to subspecies of *Ipomoea polpha*

1 Leaves ovate to oblong-ovate, length:breadth >1.4; leaf base rounded to truncate, occasionally sub-cordate in older parts; outer sepals at fruiting 11–14 mm long . . . . . **I. polpha** subsp. **polpha**
Leaves broadly ovate to ovate-orbicular, length:breadth <1.4 2

2 Outer sepals at fruiting 13–16 mm long; leaf base obtuse to truncate, becoming sub-cordate in older parts . . . . . **I. polpha** subsp. **latzii**
Outer sepals at fruiting 8–12 mm long; leaf base sub-cordate to cordate, occasionally rounded to truncate . . . . . **I. polpha** subsp. **weirana**

Ipomoea polpha R.W.Johnson subsp. **polpha**

Leaves ovate to oblong-ovate, base rounded to truncate, rarely sub-cordate, length:breadth >1.4; outer sepals at fruiting 11–14 mm long.

***Additional selected specimens examined*: Queensland.** Burke District: main track W of Blackbraes, N of Hughenden, Apr 2002, *Bean 18866* (BRI); off Hughenden road opposite Yarramulla, 1977, *Mitchell s.n.* (BRI [AQ228696]); Chudleigh Park, Hughenden, Mar 1958, *Walter s.n.* (BRI [AQ348164]). Cook District: Yarramulla Stn, off Gulf Development road, 100 km SSW of Mt Garnet, Jan 1990, *Batianoff 900119 & Smith* (BRI); Davies Creek Forestry Access road, 16 km from Mareeba, Mar 1973, *Broadley 123* (BRI [AQ9236]); the jump up, *c.* 3.5 km N of Walkamin on road to Mareeba, Jan 1980, *Clarkson 2754* (BRI); 12 km SE of Mount Janet, *c.* 11.5 km SW of Lakeland Downs Township, Jan 1986, *Clarkson 6290* (BRI); "Whitewater" (Grid Ref 7861–470892), Jan 1993, *Fensham 449* (BRI); Biboohra, Dec 1935, *Flecker s.n.* (BRI [AQ276641]); Jump Up, Mareeba, Mar 1977, *Gray 346* (BRI); Price Creek road, 40 km W of Mareeba, Apr 1973, *Halfpapp 127* (BRI); the jump-up, *c.* 20 km S of Mareeba on road to Atherton, Mar 1977, *Henderson H2460* (BRI); Mt Surprise, Dec 1981, *Hinton 221* (BRI); 82 km N of Lynd Junction, Dec 1999, *McDonald KRM196* (BRI); St Ronan's Stn, Mt Garnet, Dec 1960, *Myers s.n.* (BRI); "The Jump Up", 3.5 km N of Walkamin, Feb 1990, *Neldner 2860* (BRI); Maitland Downs Station - Upper Einasleigh River, Apr 2003, *Sankowsky 1906* (BRI); 81 km from Mt Garnet along Kennedy Highway towards the Lynd, Feb 1983, *Telford & Butler 9481* (BRI); Davies Creek, E of Mareeba, Feb 1963, *Wyatt 22* (BRI); 10 km S of Mareeba by roadside, Dec 1973, *Wyatt 2* (BRI). North Kennedy District: N of Cardwell, Jul 1978, *Collet A4* (BRI); Connolly near pig-trap, S of Ravenswood, Mar 1981, *Jackes 3* (BRI); 13 km N of Greenvale, Mar 1991, *Jeffrey TWR449* (BRI); Me[a]dowbank Station, *c.* 100 km S of Mt Garnet, Dec 2002, *Kerr s.n.* (BRI [AQ771223]); Home Hill – Bowen road *c.* 17 km from Home Hill, Oct 1974, *Moriarty 1624* (BRI); *c.* 100 km NW of Greenvale, Jan 1982, *Pedley* 4826 (BRI); 20 km S of Irvinebank, Jan 1985, *Sankowsky & Sankowsky 390* (BRI); 4 miles [6.4 km] S of Inkerman, 11 miles [17.6 km] S of Home Hill, Oct 1968, *Williams 224* (BRI); Meadowbank Station road, 3 km from Kennedy Development road, Apr 1980, *Williams 80013* (BRI).

***Distribution and habitat*:** This subspecies extends along coastal ranges from southwest of Lakeland Downs (north of Mareeba) in the north to southwest of Home Hill and as far west as Hughenden **(Map 1)**. This subspecies is commonly found in grassy eucalypt woodlands and open forests with *Eucalyptus crebra*, *E. cullenii*, *E. leptophleba and Corymbia clarksoniana* prominent. It is commonly found on tablelands (jump-ups) and is frequently found along roadsides where disturbance promotes growth from tubers.

***Notes*:** Notes on a specimen collected from the Burdekin (*Bowman 366*, MEL95512) state "The yam which is produced at the root of this *Ipomoea* is one of the principal articles of food of the aborigines in this district". There is also one record of this taxon being suspected of poisoning stock (*Jeffrey TWR 449*).

***Conservation Status*:** This subspecies is not rare or threatened.

Ipomoea polpha subsp. **latzii** R.W. Johnson, **subsp. nov.** differt a *I. polpha* subsp. *polpha* foliis plus late ovatis rationibus longitudinum latitudinibus minus quam 1.4 et a *I. polpha* subsp. *weirana* sepalis exterioris ubi fructiferis longioribus. **Typus:** Northern Territory. 39 km ENE of Ti Tree roadhouse, 6 November 1986, *P.K. Latz 10406* (holo: BRI; iso: DNA, *n.v.*).

Leaves broadly ovate to ovate-orbicular, length:breadth <1.4, base obtuse to truncate, becoming sub-cordate in older parts; outer sepals at fruiting 13–16 mm long.

***Additional specimens examined*: Northern Territory.** Stirling–Tea Tree boundary, May 1979, *Latz 8252* (BRI, DNA); 39 km ENE of Ti Tree roadhouse, Nov 1986, *Latz 10406* (BRI, DNA); Alice Springs Arid Zone Research Institute (cultivated), Feb 1988, *Soos s.n.* (BRI [AQ368008]); 20 km SE of Merino Bore, Stirling Station, Mar 1983, *Thomson 511* (BRI, DNA).

***Distribution and habitat*:** This subspecies is confined to approximately 100 km^2 on Stirling and Ti Tree stations, approximately 200 km north-east of Alice Springs (Soos & Latz 1987) **(Map 1)**. It is commonly found in grassy shrublands of mulga (*Acacia aneura*) and witchetty bush (*A. kempeana*) in sandy to red clay loam soils on run-on areas. In moister areas, it can occur under mature bloodwood (*Corymbia opaca*) and coolibah (*E. coolabah*) (Soos & Latz 1987).

***Notes*:** The current and past status of this population and its management has been intensively studied (Soos & Latz 1987). They found "the native sweet potato was a favoured and reliable food for the Anmatyerre [Anmatjirra] people [of the Northern Territory], its large edible tuber being collected at any time of the year". Because this subspecies was widely known among the aboriginal people beyond those living within its current geographical distribution, they believed the plant was either previously more widespread in the Northern Territory, traded or that neighbouring tribes were involved in sweet potato ceremonies.

***Conservation status*:** This subspecies is listed under '*Ipomoea* A83192 Stirling' as Vulnerable in the Northern Territory and under '*Ipomoea* sp. Stirling (P.K. Latz 10408)' as Vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999*.

***Etymology*:** It is named in honour of the botanist Peter Latz, a colleague, who with Antal Soos studied the uses, status and conservation management of this plant.

Ipomoea polpha subsp. **weirana** R.W.Johnson, **subsp. nov.** differt a *I. polpha* subsp. *polpha* foliis plus late ovatis rationibus longitudinum latitudinibus minus quam 1.4 et a *I. polpha* subsp. *latzii* sepalis exterioris ubi fructiferis brevioribus. **Typus:** Queensland. Maranoa District: 26 km from St George towards Dalby, 25 January 1998, *A.R. Bean 13086* (holo: BRI; iso: DNA, *n.v.*).

Leaves broadly ovate to ovate-orbicular, length:breadth <1.4, base sub-cordate to cordate, rarely rounded or truncate; outer sepals at fruiting 8–12 mm long.

***Additional selected specimens examined*: Queensland**. Warrego District: 41.5 km from Adavale on Adavale – Blackall road, Apr 1973, *Percy s.n.* (BRI [AQ9461]). Maranoa District: St George, May 1962, *Allison s.n.* (BRI [AQ276178]); St George on Wanganui property, Mar 1970, *Barnes & McEwan s.n.* (BRI [AQ276180]); 90 km S of Mitchell on St George road, Mar 1994, *Burton s.n.* (BRI); South Coogoon turnoff, 73 km S of Roma, Nov 1986, *Dowling s.n.* (BRI [AQ407777]); *c.* 70 km S of Roma on old southern road opposite entrance to South Coogoon, Oct 1986, *Dowling s.n.* (BRI [AQ407774]); 91.6 km W of Westmar, Moonie Highway, just past Drain Creek, Oct 1984, *Forster PIF1920* (BRI); between Condamine and St George, May 1920, *Gunn s.n.* (BRI [AQ276183]); *c.* 10 miles [16 km] N of St George on Surat road, Nov 1972, *Johnson & Blaxell 983* (BRI, NSW); 65 km S of Roma on the southern road, Dec 1994, *McKenzie s.n.* (BRI [AQ633648]); 6.4 km W of Moonie River [along Moonie Highway?], Nov 1973, *Pederson s.n.* (BRI [AQ12437]); 15 miles [24 km] E of St George on Moonie Highway, Nov 1961, *Pedley 910* (BRI); 36 miles [57.6 km] E of St George, Apr 1963, *Pedley 1238* (BRI); *c.* 16 km from Ballaroo on Ballaroo – Surat road, Apr 1973, *Percy s.n.* (BRI [AQ9460]); 20 km E of St George on the St George – Dalby road, Mar 1976, *Purdie s.n.* (BRI [AQ400762]); Nindigully District, Nov 1938, *Roe 7694* (BRI); Glenearn Station, 40 miles [64 km] S of Surat, Mar 1963, *Sewell s.n.* (BRI [AQ276175]); "Gleneam", Surat, 90 miles [144 km] SSE of Roma, Apr 1963, *Webster s.n.* (BRI [AQ276177]); 70 km W of Westmar on Moonie Highway, Oct 1981, *Williams 81235* (BRI).

***Distribution and habitat*:** This subspecies is found in the Roma – St George – Moonie area of southern Queensland except for an outlier *c.* 42 km NW of Adavale. It is known locally as "Weir Vine" **(Map 1)**. It occurs in mulga (*Acacia aneura*) and poplar box (*Eucalyptus populnea*) grassy woodlands on red brown loam soils. It is frequently found along roadsides where disturbance promotes growth from tubers.

***Notes*:** Associated with a specimen collected from the Balonne & Weir River in 1880 (*Done s.n.*, MEL 95475) is a letter of 10 May 1881 from George L. Done to Robert D. Fitzgerald. This letter was forwarded to Mueller and states "I have seen an old resident of the Moonie River and he states that the "Weir" grows wild all over the country between the Moonie and Balonne Rivers wherever the soil is red and rich but he never saw it growing on sand ridges. On the roots it produces a fruit which is like a turnip when cut but which he states is as juicy as a watermelon and which he has seen as large as 15 inches in diameter.

The fruit is relished by blacks and whites, by the former especially. He is certain the plant was growing wild when the country was first taken up and says he does not think it bears until it is 4 years old. The fruit is not good when cooked but is very much relished when eaten as soon as it is dug up".

Following the opening up of the area for pastoral activities this subspecies has proved to be highly toxic to sheep and also cattle (Everist 1974). Major stock losses have occurred following grazing of fresh growth particularly when other feed is scarce.

***Conservation status*:** Though the area of distribution of this taxon has been greatly developed for pastoral and agricultural uses it has persisted under this disturbance largely due to its ability to regrow from its protected tubers. It is not regarded as threatened.

***Etymology*:** The subspecific epithet and common name, Weir vine, refer to the Weir River, which passes through the geographic range of this taxon.

General Discussion

(a) Glasshouse studies

Seed from the three populations was grown in a glasshouse at Alice Springs. Specimens taken from the glasshouse plants are housed at BRI and DNA. The differences which are apparent from a study of the field specimens become blurred when the cultivated specimens are compared. The specimens grown from seed collected near Mareeba (*Ipomoea polpha* subsp. *polpha*) have the shorter outer sepals and sub-cordate leaf bases of *I. polpha* subsp. *weirana* while the specimens from seed from Surat (*I. polpha* subsp. *weirana*) has longer outer sepals and more rounded leaf bases. It is possible the seed forwarded to Alice Springs was incorrectly labelled or that some irregularity occurred at Alice Springs. If these populations have been only recently isolated it may be that differences in the subspecies as noted in the field may be caused as much by disparate environmental conditions as by genetic divergence. Certainly genetic and chemical analyses suggest these populations are distinct (Austin *et al.*, 1993; Molyneux *et al.*, 1995).

(b) Comments on the disjunct distribution of the three subspecies

The morphological and genetic similarity of the three subspecies and their disjunct distribution poses questions as to their origin. All three subspecies seem to have been intensively used by local aboriginal populations. The two most likely explanations are that either the species was formerly widespread throughout northeastern Australia and has suffered extreme fragmentation or that its original distribution was more restricted but the tubers were widely traded and cultivated.

If it had a much wider distribution in the past then some explanation of the cause of the fragmentation is necessary. Two possible causes might be climate change or overexploitation by aboriginals. Because the subspecies currently occur in climatically and ecologically different areas it is hard to evoke climatic change. Overexploitation of the tubers for food could fragment the original population but there appears to be no historical evidence to support this claim.

To explain the current distribution on the basis of trading in tubers or seed is also difficult. Mulvaney (1976) remarked that food was rarely exchanged and I was unable to find any record of the widespread distribution of food over vast distances through trading. Soos & Latz (1987) provide evidence of trading of the tubers among neighbouring tribes in the Northern Territory. Similarly Hynes & Chase (1982) obtained evidence that yams (*Dioscorea* sp.) were transported from the mainland of northeastern Australia to offshore islands where they were planted. Though in both these cases distances involved were small, it does indicate aboriginals did transport food materials for growing in areas beyond their current range.

There is much evidence that a chain of connection existed between distant tribes in northern Australia (Mulvaney 1975, 1976). Trade and exchange networks crisscrossing the arid and semi-arid zones served as the main lines of communication between far-flung tribes (Mulvaney & Kamminga 1999). Many items such as shell, ochre and wooden tools were traded over long distances

(Mulvaney 1975). Perhaps the most striking example of diffusion concerns the occurrence of shell pendents, which were prized and sacred objects in rituals, more than 1000 miles [1600 km] away from their source. He cites a boomerang which was found at least 1200 km from its point of manufacture. Reports of long distance trading of pituri (*Duboisia hopwoodii*) are common (Mulvaney 1975; Latz 1995).

If past trading activities have played a role in the development of the disjunct distribution pattern of the species, then those populations in northeastern Australia being the most extensive and diverse may have been the original source of the traded material.

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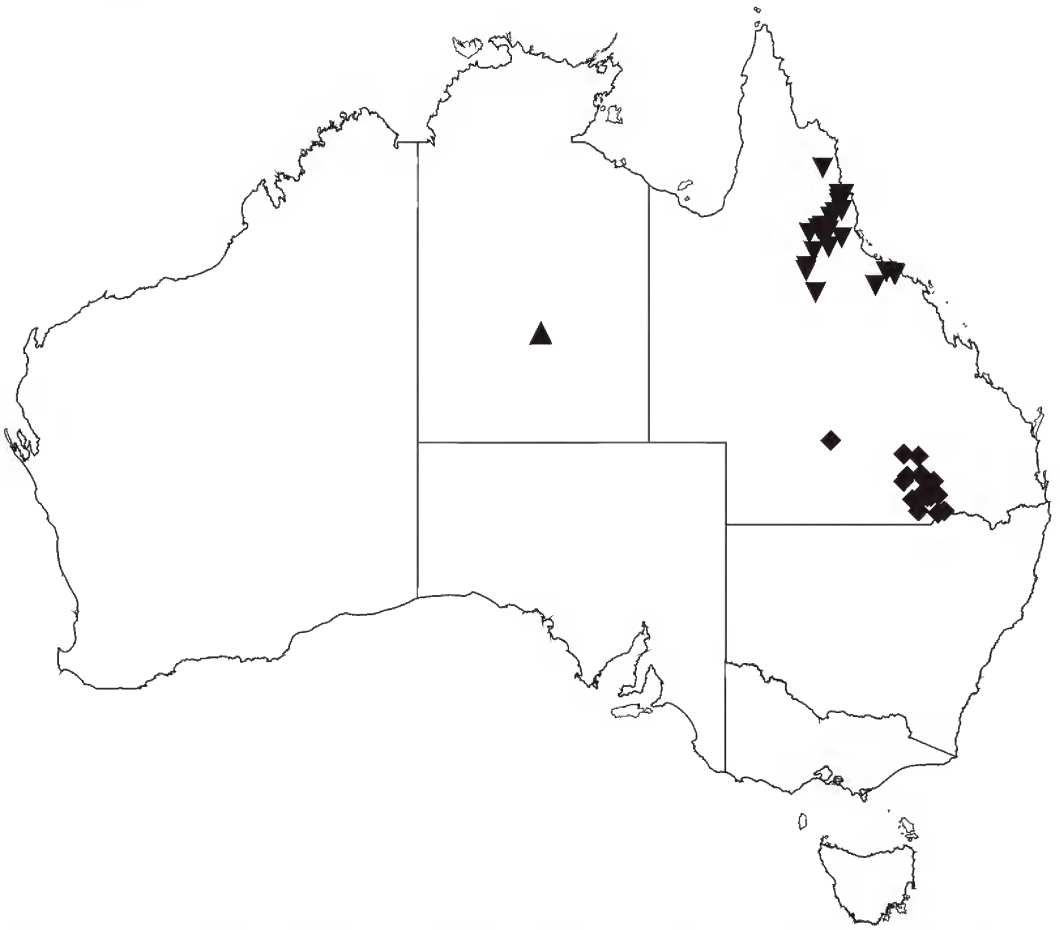

Map1. Distribution of *Ipomoea polpha* subsp. *polpha* ▼, *I. polpha* subsp. *latzii* ▲ and *I. polpha* subsp. *weirana* ◆.